



CLEAN COAL TODAY

A NEWSLETTER ABOUT INNOVATIVE TECHNOLOGIES FOR COAL UTILIZATION

ANNUAL INDEX OF ARTICLES

Clean Coal Today is a quarterly newsletter of the U.S. Department of Energy (DOE) Office of Clean Coal (OCC). Its primary objective is to inform OCC stakeholders of the progress and status of a wide range of OCC R&D activities. *Clean Coal Today* features news of the latest coal-related R&D advances, and reports on timely policy and environmental topics. Progress of various demonstration programs is reported, including the Clean Coal Power Initiative (CCPI), Power Plant Improvement Initiative (PPII), and the original Clean Coal Technology (CCT) Demonstration Program. A News Bytes column appears in every issue, and recurring columns include R&D Milestones achieved by in-house and contractor researchers, International Initiatives, State and Regional activities, and guest stakeholder articles.

Clean Coal Today is mailed to some 3,500 domestic and international readers, and also may be found on the Internet as part of the Clean Coal Technology Compendium (www.netl.doe.gov/technologies/coalpower/cctc/newsletter/newsletter.html). The newsletter reaches a broad audience including users and vendors of clean coal technologies, the coal R&D community, regulators and public policy makers, environmental organizations, financiers, exporters, public interest groups, and the general public.

During 2008, the Carbon Sequestration Regional Partnerships entered the deployment phase. Important work was conducted on advanced sensors for next generation power plants, while a new fuel cell stack testing device was developed by the Solid State Energy Conversion Alliance. *Clean Coal Today* reported successful outcomes for two major demonstration projects. The newsletter also detailed efforts to bring mercury control technology to commercial readiness, and conserve freshwater in power plant operations. Two major sequestration conferences were featured. Stories also drew attention to work with China, India, and other international partners.

Beginning with Issue No. 1, published in 1990, this *Index of Articles* for issues 1–78 of *Clean Coal Today* will assist readers in identifying articles of interest. Pages 2–18 present articles arranged by subject area. Pages 19–26 present articles on CCT, CCPI, and PPII projects organized by technology category.

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— CARBON SEQUESTRATION LEADERSHIP FORUM —

• DOE Announces New Hydrogen-Sequestration Efforts	Spring 2003: 2
• DOE and State Department Hold First Sequestration Forum	Summer 2003: 1
• U.S. DOE is Carbon Sequestration Leadership Forum Secretariat	Fall/Winter 2003: 10
• CSLF Meets in Rome	Spring 2004: 8
• Sequestration Leadership Forum Meets in Australia	Winter 2004: 1
• CSLF Expands Participation, Meets in Berlin	Winter 2005: 8
• CSLF Capacity Building Workshop	Summer 2007: 8

— CLEAN COAL TECHNOLOGY PROGRAM ACTIVITIES —

– CCT Conferences –

• Notable First Annual Clean Coal Conference: Technology Developers Linked with Wide Range of Users	Fall 1992: 1
• Second Annual CCT Conference Examines Technology Markets; CCT Markets Session Examines Market Opportunities at Home and Abroad; Deployment/Outreach Panel Addresses Opportunities for Commercial Success	Fall 1993: 1, 5, 6
• Third Annual CCT Conference Highlights Program Successes; CCT International/Domestic Markets Explored by International and Industry Analysts	Winter 1994: 1, 6
• The Global Opportunity: A Message from Pat Godley, Assistant Secretary for Fossil Energy (Special Fourth Annual CCT Conference Edition)	Fall 1995: 1
• Welcome — From Our Sponsors (Special Fourth Annual CCT Conference Edition)	Fall 1995: 1
• A Message from the Editor (Fourth Annual CCT Conference)	Winter 1995: 3
• CCT Conference Preview (Fifth Annual CCT Conference)	Winter 1996: 12
• Fifth Annual CCT Conference Addresses CCT's Future	Spring 1997: 1
• Thanks to CCT Conference Sponsors (Fifth Annual CCT Conference)	Spring 1997: 3
• Sixth Clean Coal Technology Conference Preview	Spring 1998: 12
• CCTs Technical Progress Update (Sixth Annual CCT Conference)	Summer 1998: 4
• Seventh Clean Coal Technology Conference Preview	Summer 1999: 15
• DOE Clean Coal and Power Conference	Fall 2001: 2
• Clean Coal and Power Conference Explores Coal's Future	Winter 2001: 1
• DOE and U.S.-China Conferences Focus on Coal	Fall/Winter 2003: 1
• Clean Coal Conference Highlights Technology Promise	Winter 2005: 1

– CCT Program Direction –

• Fourth PON Release Near	Winter 1990: 5
• Comprehensive Reports to Congress for Clean Coal Technology Projects	Winter 1990: 11
• Round IV Update	Spring/Summer 1991: 7; Winter 1991: 3; Summer 1992: 7; Fall 1992: 5

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• Round V Update		Fall 1991: 3; Summer 1992: 4; Winter 1992: 5
• Award-Winning Clean Coal Technology Demonstration Projects		Spring 1996: 3
• Completed Projects — Participants' Final Reports		Spring 1998: 11; Summer 1998: 16
• Completed CCT Projects Summarized in New Publications		Fall 1999: 5
• Timeline of Active CCT Projects		Summer 2000: 15
• New Clean Coal Efforts Gain Momentum		Summer 2001: 1
• Progress Under Two Clean Coal Funding Vehicles		Winter 2001: 7
– CCT Program Outreach –		
• Debut of <i>Clean Coal Today</i>		Winter 1990: 1
• Clean Coal Outreach		Spring 1991: 1; Spring 1996: 18
• Exhibits Accent Reducing Greenhouse Gas Emissions (Clean Coal Celebrates Earth Day 1994)		Spring 1994: 1
• DOE Launches New Clean Coal Technology Web site (CCT Compendium)		Spring 1998: 9; Fall 1999: 13
– CCT Successes and Commercialization –		
• Introducing the Global CCT Opportunity (Fourth Annual CCT Conference)		Winter 1995: 1
• O'Leary Heralds Wabash Startup (Fourth Annual CCT Conference)		Winter 1995: 1
• CCT Commercialization Challenges (Fourth Annual CCT Conference)		Winter 1995: 4
• International CCT Deployment Needs Strong U.S. Support (Fourth Annual CCT Conference)		Winter 1995: 5
• Improving the "Enabling Environment" for CCTs (Fourth Annual CCT Conference)		Winter 1995: 8
• Expanding the International Market (Fourth Annual CCT Conference)		Winter 1995: 12
• O'Leary Heralds Bright Future for Coal		Fall 1996: 12
• Commercialization Updates/Briefs		Fall/Winter 1996: 3; Spring 1997: 6; Summer/Fall/Winter 1997: 3
• Opportunities for IGCC		Winter 1996: 9
• DOE/Industry Seminars Identify CCT Opportunities and Challenges		Winter 1997: 4
• Challenges and Opportunities for Clean Coal Technology (Sixth Annual CCT Conference)		Summer 1998: 1
• Carbon Offsets Create Business Opportunities for CCTs (Sixth Annual CCT Conference)		Summer 1998: 10
• CCT Program Successes		Summer 1999: 11
• Clean Coal Technology in the Next Millennium (Seventh Annual CCT Conference)		Fall 1999: 3
• Successful Demonstration of SNCR at AEP's 600-MWe Cardinal Plant		Summer 2000: 6
• Powerplant Award, Multiple Visits Precede JEA Dedication		Fall/Winter 2002: 1
• FE Encourages Small Business Research		Fall/Winter 2007: 6
— COMPUTATIONAL SCIENCE (3-D VISUALIZATION, SUPERCOMPUTING, MODELING, ETC.) —		
• Virtual Energy Plants of the Future		Summer 2001: 3
• NETL Hosts Virtual Simulation Workshop		Winter 2001: 10

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• Computer Code Can Help Build Better Fluidized Beds		Spring 2004: 12
• Virtual Reality to Improve New Power Plant Designs, Lower Costs		Summer 2004: 4
• Computational Methods for Hydrogen Membranes		Spring 2005: 8
• Technology Development through High-Performance Computing		Summer 2005: 10
• High-Fidelity Process Co-Simulation of Advanced Power Generation Systems		Fall 2006: 6
• NETL In-House Technologies Receive Prestigious Award		Spring 2008: 4
• Large Eddy Simulation for Advanced Power Systems		Fall 2008: 6
• Demonstration of Integrated Optimization Software		Winter 2008: 4
• IGCC Dynamic Simulator Research and Training Center		Winter 2008: 8

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• Clean Coal Technology Workshop in India	Winter 1996: 5
• DOE Sponsors CCT and Coal Utilization Workshop	Winter 1997: 9
• Ukraine Conference Highlights Financial Recovery, Obstacles to Power Sector Development	Summer 1998: 12
• Advanced Coal-Based Power and Environmental Systems '98 Conference	Fall 1998: 7
• Pittsburgh Coal Conference – Panel Highlights Asia Energy Picture	Winter 1998: 5
• First Annual Meeting of U.S.–China Energy and Environmental Technology Center	Summer 1999: 9
• U.S./Japan Workshop Highlights R&D Cooperation	Summer 1999: 9
• U.S./Turkey Conference Highlights Fossil Energy	Fall 1999: 6
• Carbon Sequestration Workshop Focuses on R&D	Winter 1999: 8
• Kyoto Update: COP 5	Winter 1999: 9
• CoalTech '99 Conference in Jakarta, Indonesia	Winter 1999: 12
• DOE Participates in International Conference in India	Spring 2000: 10
• FE Hosts Annual NO _x Specialty Conferences	Fall 2000: 6
• Two Major Conferences in China Under DOE–MOST Protocol	Spring 2001: 8
• Gasification Technologies Workshop for Environmental Regulators	Summer 2001: 8
• NETL Hosts Sensors and Controls Workshop	Summer 2001: 9
• First National Conference on Carbon Sequestration	Fall 2001: 3
• NETL Hosts Virtual Simulation Workshop	Winter 2001: 10
• Combustion Workshop Solicits Stakeholder Input	Spring 2002: 11
• FE Hosts Specialty Conferences	Summer 2002: 4
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• NETL Conference on PM _{2.5} and Electric Power	Summer 2002: 9

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• FE Hosts Speciality Conferences		Fall/Winter 2003: 16
• DOE-NETL Chair Third Carbon Capture and Sequestration Conference		Summer 2004: 1
• 30th Annual Clearwater Coal Conference		Summer 2005: 3
• Unburned Carbon Conference Joins World of Coal Ash		Summer 2005: 13
• Sequestration Conference Explores Technology Progress		Spring/Summer 2006: 1
• 2006 NETL Environmental Controls Conference		Spring/Summer 2006: 16
• China Gasification and Liquefaction Workshop		Fall 2006: 11
• NETL Hosts Mercury Control Conference		Spring 2007: 1
• Regional Partnerships Lead U.S. Carbon Sequestration		Summer 2007: 1
• CSLF Capacity Building Workshop		Summer 2007: 1
• Air Quality VI Details Environmental Progress		Fall/Winter 2007: 1
• Regional Partnerships to Sequester CO ₂ at Near-Commercial Scale		Summer 2008: 1
• International Greenhouse Gas Conference Focuses on CCS		Winter 2008: 1

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– Carbon Capture and Storage –

• Global CO ₂ Control Agenda	Winter 1997: 5
• CO ₂ Sequestration to Reduce Greenhouse Gas	Spring 1998: 3
• Carbon Offsets Create Business Opportunities for CCTs	Summer 1998: 10
• Novel Concepts Awards	Summer 1998: 14
• Geological CO ₂ Sequestration to Benefit Coal's Future	Spring 1999: 12
• Energy Secretary Issues Carbon Sequestration Challenge (Seventh Annual CCT Conference)	Fall 1999: 1
• Carbon Sequestration Workshop Focuses on R&D	Winter 1999: 8
• Kyoto Update: COP 5	Winter 1999: 9
• Carbon Products Consortium Reviews Accomplishments and Future Research (guest article)	Winter 2000: 4
• Fossil Energy's CO ₂ Sequestration Program Gains Momentum	Winter 2000: 6
• First National Conference on Carbon Sequestration to be Held	Winter 2000: 8
• CO ₂ Capture RD&D Test Network Created	Winter 2000: 9
• International CO ₂ Ocean Sequestration Field Experiment: 2000 Oceanographic Research Cruise	Winter 2000: 10
• First National Conference on Carbon Sequestration	Fall 2001: 3
• TVA Mined Land Becomes Carbon Sink	Fall 2001: 8
• New APEC Report on CO ₂ Reduction Options	Winter 2001: 8
• Coalbed Methane — Enhancing Production and Sequestering CO ₂	Summer 2002: 7
• Brine Aquifers for CO ₂ Sequestration	Summer 2002: 10

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• Weyburn Demonstrating New CO ₂ Storage, Monitoring, and Verification Techniques		Fall/Winter 2002: 12
• DOE Announces New Hydrogen-Sequestration Efforts		Spring 2003: 2
• DOE Hosts First Meeting of Regional Sequestration Partnerships		Fall/Winter 2003: 4
• Seven Regional Carbon Sequestration Partnerships		Fall/Winter 2003: 5
• Carbon Sequestration Program Explores Options		Spring 2004: 6
• DOE-NETL Chair Third Carbon Capture and Sequestration Conference		Summer 2004: 1
• Sequestration Conference Reports on International CO ₂ Capture Project		Summer 2004: 3
• FE-European Commission Meet to Discuss CO ₂ Cooperation		Summer 2004: 9
• Hydrate Process to Capture and Sequester CO ₂ from Coal Syngas		Fall 2004: 3
• CO ₂ Sequestration Monitoring in Norway's North Sea		Fall 2004: 12
• Advances in CO ₂ Capture Via Oxygen-Based Combustion Processes		Winter 2004: 10
• First Annual Carbon Sequestration Regional Partnership Meeting		Spring 2005: 1
• Field Tests Validate Geosequestration		Summer 2005: 8
• U.S. and Canada Cooperate on Oxy-Combustion		Fall 2005: 9
• Appalachian Mine Land Restoration Demonstrates Sequestration Benefits		Winter 2005: 7
• Sequestration Conference Explores Technology Progress		Spring/Summer 2006: 1
• NatCarb Evaluating Carbon Sequestration Potential		Spring/Summer 2006: 4
• Carbon Offset Opportunity Program		Fall 2006: 4
• NETL Carbon Sequestration Newsletter		Fall 2006: 5
• NETL Monitors CO ₂ Storage		Spring 2007: 6
• Regional Partnerships Lead U.S. Carbon Sequestration Efforts		Summer 2007: 1
• RECS Student Sequestration Program		Fall/Winter 2007: 8
• NETL Emphasizes CO ₂ Capture from Existing Plants		Spring 2008: 1
• NETL In-House Technologies Receive Prestigious Award		Spring 2008: 4
• Regional Partnerships to Sequester CO ₂ at Near-Commercial Scale		Summer 2008: 1
• International Greenhouse Gas Conference Focuses on CCS		Winter 2008: 1
• DOE Releases Carbon Sequestration Atlas		Winter 2008: 10
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• Clean Coal Projects Join Integrated Effort to Obtain Toxic Air Pollutant Data		Winter 1991: 7
• Update — Clean Coal Air Toxics Testing Programs		Winter 1993: 3
• Air Toxics: Hazardous Emissions From Coal Combustion		Spring 1997: 8
• CCT NO _x Controls Realize Commercial Acceptance		Winter 1997: 5
• Monitoring Effort Initiated Under PM _{2.5} Program		Summer 1998: 8
• FE's Mercury Program – Quality Measurements and Cost-Effective Controls		Summer 2000: 8
• Regulatory Update		Summer 2000: 10
• PM _{2.5} Monitoring Effort Advances		Fall 2000: 6

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• FE Hosts Annual NO _x Specialty Conferences		Fall 2000: 13
• DOE Stays Ahead of Mercury Regulation Momentum		Spring 2001: 5
• Sulfur Removal From Gasification-Derived Syngas		Summer 2001: 4
• Environmental Benefits Topical Report Published		Summer 2001: 6
• Gasification Technologies Workshop for Environmental Regulators		Summer 2001: 8
• Ongoing Research Updates PM _{2.5} Source Fingerprints		Winter 2001: 6
• Clear Skies Initiative		Summer 2002: 8
• DOE Addresses Emerging Electric Utility Water Issues		Spring 2003: 8
• Energy & Environmental Research Center		Spring 2003: 10
• DOE Explores Externalities Cost		Spring 2003: 12
• Low-NO _x Testing Produces Results		Summer 2003: 3
• DOE Mercury Control Progressing		Spring 2004: 3
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• DOE Pursues Environmentally Friendly Zebra Mussel Control		Fall 2004: 4
• NETL Reviews Field Data on Mercury Speciation		Fall 2004: 6
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• Thermoelectric Freshwater Needs		Winter 2004: 9
• NETL Assists in Measuring China's Mercury Emissions		Winter 2004: 12
• Low NO _x from IGCC Turbines		Spring 2005: 9
• NO _x Control Program Addresses Clean Air Interstate Rule (CAIR)		Summer 2005: 5
• New DOE Efforts on Power Plant Water Management		Winter 2005: 5
• 2006 NETL Environmental Controls Conference		Spring/Summer 2006: 16
• Cost and Performance of Activated Carbon Injection for Mercury Control		Fall 2006: 8
• Activated Carbon Injection Test Sites		Fall 2006: 10
• NETL Hosts Mercury Control Conference		Spring 2007: 1
• Researching Power Plant Water Recovery		Spring 2008: 6
• Activated Carbon Injection – A Mercury Control Success Story		Summer 2008: 4
• NETL Licenses Mercury Controls Processes		Summer 2008: 6
• Greenidge Multi-Pollutant Project Achieves Emissions Reduction Goals		Summer 2008: 10

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• United States Energy Association's Focus on Coal	Winter 1999: 6
• UCIG Meets to Evaluate Coal-Derived Fuels Research	Winter 1999: 9

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• Long-Running University Coal Research Program Advances Science of Coal		Fall 2001: 9
• NAS Review Validates FE Research Efforts		Fall 2001: 10
• EPRI – Bringing Advanced Clean Coal Technology to Market		Spring 2002: 4
• Energy Bill Supports Coal		Fall 2005: 8
• Advanced Separation Consortium		Winter 2006: 4
• 2007 Budget Emphasizes Clean Coal		Spring 2007: 7
– Coal-to-Liquids –		
• Clean Fuels Awards		Fall 1998: 6
• Coal-Derived Fuels and the Ultra-Clean Transportation Fuels Initiative		Summer 1999: 3
• Fossil Energy’s Transportation Fuels and Chemicals R&D Program		Spring 2000: 4
• Projects Advance Development of Ultra-Clean Transportation Fuels		Spring 2001: 3
• DOE Explores Potential for Coal-to-Liquid Fuels		Spring/Summer 2006: 8
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• Biomass/Coal Cofiring Gains Favor Within Biomass Industry		Winter 1998: 7
• Results Successful from Treated-Wood/Coal Cofiring Tests		Spring 2000: 8
• Coal, Tires, and Sawdust Move Tri-Firing Concept Forward		Spring 2001: 12
• Biomass Cofiring Opportunities Awards		
• DOE Explores Co-Feeding Biomass with Coal		Summer 2008: 7
• NETL, USDA Design Coal-Stabilized Biomass Gasification Unit		Fall 2008: 4
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• New Zealand’s National Hydrogen Workshop		Spring 2003: 7
• DOE Highlights Growing Hydrogen Program		Fall/Winter 2003: 6
• Coal-Based Hydrogen Coproduction with CO ₂ Capture		Fall/Winter 2003: 7
• DOE Announces New Hydrogen-Sequestration Efforts		Spring 2003: 2
• NRC Report Cites Prime Hydrogen Role for Coal		Spring 2004: 10
• Computational Methods for Hydrogen Membranes		Spring 2005: 8
• DOE Explores Potential for Coal-to-Liquid Fuels		Spring/Summer 2006: 8
• Laser Ignition Plus Hydrogen Sparks Cleaner Combustion		Spring/Summer 2006: 12
• Membrane Separation Advances in FE Hydrogen Program		Fall/Winter 2007: 4

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• By-Products Consortium Funds R&D Proposals		Winter 1999: 4
• DOE Examines Environmental Issues in By-Product Use		Spring 2002: 12
• Promising Pilot Tests for CBM Technology		Summer 2003: 10
• Coalbed Methane Forum Discusses DOE Resource Assessment		Spring 2005: 11
• Byproducts Consortium Awards New Projects		Spring/Summer 2006: 6

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• International CCT Finance Seminar		Fall 1996: 7
• World Bank's Clean Coal Initiative		Spring 1997: 4
• International News Bytes		Spring 1998: 7
• United Nations CCT Study Tour		Summer 1998: 13
• PCAST Supports International Energy Cooperation Programs		Winter 1999: 10
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• International CO ₂ Ocean Sequestration Field Experiment: 2000 Oceanographic Research Cruise		Winter 2000: 11
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• Sequestration Conference Reports on International CO ₂ Capture Project		Summer 2004: 3
• NETL Hosts Foreign Service Officer Coal and Power Training		Fall 2004: 11
• NETL Educating Foreign Service Officers to Meet Energy Needs		Fall 2006: 12
• Fossil Energy Participates in Asia-Pacific Partnership		Winter 2006: 1

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• DOE Supporting South Africa Energy Initiatives		Summer 1998: 11
• South Africa Project Recognized for Contributing to GHG Reduction		Fall 1998: 9
• FE Assists South African Utility in Evaluating CCTs		Summer 2000: 11

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• APEC Coal Flow Seminar: A Tool for Regional Stability		Fall 2000: 11

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• DOE Sponsors CCT and Coal Utilization Workshop (Taiyaun, China)	Winter 1997: 9
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• U.S.-China Energy and Environmental Technology Center	Spring 1998: 6
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• DOE Signs Fossil Energy Annex with Italy	Summer/Fall 1997: 10
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• FE-NETL Provides Training for Indian Power Plant Managers	Spring 2001: 9
• New Coal Ash Newsletter Launched in India	Summer 2001: 12
• NETL Supports Cooling Tower Efficiencies Training in India	Fall 2001: 12
• Engineers from India Trained in Utility Overhaul and Maintenance	Spring 2002: 8
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• TDA Joins DOE in Supporting Brazil's Quest For Clean Energy		Summer 1998: 12
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• Membrane Improvements Support Gas Separation		Winter 2001: 4
• High-Temperature Materials Testing Record at CERF		Spring 2002: 10
• Consortium Makes Progress on Materials Development		Spring 2004: 11
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• Materials Research at Albany Research Center		Spring 2005: 4
• U.S.-UK Workshop on Advanced Materials		Summer 2005: 12
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• Innovative Oxygen Separation Membrane Prototype		Fall 2006: 1
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• Power Systems Development Facility – Ensuring Clean Affordable Power for the 21 st Century	Fall 2000: 1
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• DOE-Stamet, Inc. High-Pressure Feeder Research Program	Summer 2005: 7
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• SECA Core Technology Program Review Meeting		Fall/Winter 2003: 3
• World's Largest Clean Coal-Powered Fuel Cell		Fall 2004: 1
• New DOE Program to Advance Fuel Cell Central Power Stations		Fall 2005: 1
• SECA Fuel Cell Test Device Advances Technology Transfer		Summer 2008: 8
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• Materials Research at Albany Research Center: Sensing Corrosion Present Under Ash Deposits, Improving Refractories for Coal Gasifiers		Spring 2005: 4
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• FutureGen Project Takes Shape		Winter 2005: 4
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• Hydrogen Turbines for Coal-Based IGCC and FutureGen		Spring/Summer 2006: 10
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• Laser Technology Has Potential to Enhance Gasifier Reliability		Fall 2001: 11
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• Gasification Markets and Technologies Report		Fall/Winter 2002: 11
• NETL Completes a Successful PDU Test		Fall/Winter 2003: 11
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• Coal-Based Hydrogen Coproduction with CO ₂ Capture – National Fuel Cell Research Center/Advanced Power and Energy Program (NFCRC), University of California, Irvine		Fall/Winter 2003: 7
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• DOE Launches New Clean Coal Technology Web Site (CCT Compendium)		Spring 1998: 9; Fall 1999: 13
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• DOE Fossil Energy International World Wide Web Site		Spring 2001: 9
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• Power Generation Competition Threatens Clean Coal (Fourth Annual CCT Conference)		Winter 1995: 9
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• National Energy Policy Highlights		Summer 2001: 2
• Gasification Technologies Workshop for Environmental Regulators		Summer 2001: 8
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| • DOE Issued Solicitation for Clean Coal Power Initiative | Spring 2002: 1 |
| • NETL Holds Clean Coal Power Initiative Preaward Meeting | Spring 2003: 4 |
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| • Two CCPI Projects Move Forward | Summer 2004: 6 |
| • New Projects Join CCPI | Spring 2005: 6 |
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| • Congress Enacts New Power Plant Improvement Initiative | Winter 2000: 1 |
| • Progress Under Two Clean Coal Funding Vehicles | Winter 2001: 7 |
| • First PPII Projects Successfully Negotiated | Fall/Winter 2002: 4 |
| • Two New PPII Projects Move Forward | Summer 2003: 8 |
| • Greenidge Multi-Pollutant Project Achieves Emissions Reduction Goals | Summer 2008: 10 |

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| • Five New Clean Coal Projects: Demonstration of Clean Coal Diesel Technology at Easton Utilities | Spring 1993: 3 |
| • Coal-Fueled Diesel Demonstration Project Re-Sited to Alaska | Fall 1996: 14 |
| • Coal-Fueled Diesel Engine Demonstration Given Go-Ahead for Alaska | Winter 1997: 1 |
| • Coal-Fueled Diesel on Schedule for January 1999 Delivery to Fairbanks, Alaska | Winter 1998: 6 |

Healy Clean Coal Project*Alaska Industrial Development and Export Authority*

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| • Healy Celebrates a Successful Groundbreaking | Summer 1995: 1 |
| • Progress and Achievements | Fall 1995: 4 |
| • Healy Clean Coal Project Provides Power & Environmental Benefits | Fall 1998: 1 |

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| • Five New Clean Coal Projects: Warren Station EFCC Demonstration Project | Spring 1993: 3 |
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– Advanced Electric Power Generation – Fluidized-Bed Combustion –**ACFB Demonstration Project***JEA*

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| • Large-Scale Atmospheric Circulating Fluidized-Bed Combustion Technology | Winter 1997: 2 |
| • JEA's Large-Scale CFB Demonstration Project Near Construction Peak | Spring 2001: 1 |
| • Powerplant Award, Multiple Visits Precede JEA Dedication | Fall/Winter 2002: 1 |
| • JEA Successfully Completes World's Largest CFB Demonstration | Fall 2005: 4 |

Circulating Fluidized-Bed (CFB) Project*Colorado-Ute Electric Association*

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| • Colorado Fluid Bed Project Yields Both Power and Data | Winter 1990: 1 |
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McIntosh Unit 4A PCFB Demonstration Project*Lakeland Electric*

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| • Two PCFB Projects Re-Sited to Lakeland, Florida | Winter 1996: 3 |
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Four Rivers Energy Modernization Project [Novated to McIntosh Unit 4A PCFB Demonstration Project]*Four Rivers Energy Partners, L.P.*

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| • Five New Clean Coal Projects: Calvert City Advanced Energy Project | Spring 1993: 2 |
| • Two PCFB Projects Re-Sited to Lakeland, Florida | Winter 1996: 3 |

McIntosh Unit 4B Topped PCFB Demonstration Project*Lakeland Electric*

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| • Two PCFB Projects Re-Sited to Lakeland, Florida | Winter 1996: 3 |
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Nucla CFB Demonstration Project*Tri-State Generation and Transmission Association, Inc.*

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| • Progress and Achievements | Fall 1995: 4 |
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PCFB Demonstration Project [Novated to McIntosh Unit 4B Topped PCFB Demonstration Project]*DMEC-1 Limited Partnership*

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| • Des Moines, Iowa Greets New Clean Coal Plant | Fall 1991: 5 |
| • Two PCFB Projects Re-Sited to Lakeland, Florida | Winter 1996: 3 |

Tidd PFBC Demonstration Project*The Ohio Power Company*

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| • Tidd Plant Produces Power: Operations Planned Early 1991 | Winter 1990: 5 |
| • Tidd Receives 1991 Power Plant Award | Spring 1991: 7 |
| • Tidd Plant Resumes Operation | Winter 1991: 3 |
| • Tidd Plant Sets New Technical Operations and Environmental Performance Records | Summer 1992: 4 |
| • Tidd Extended Runs Verify Design Basis | Fall 1992: 5 |
| • Tidd Sets Mark with Continuous 45-Day Run | Summer 1994: 4 |
| • Tidd Concludes Four-Year PFBC Test Program | Summer 1995: 5 |
| • Progress and Achievements | Fall 1995: 4 |

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Kentucky Pioneer Energy IGCC Demonstration Project (formerly Clean Energy Demonstration Project)*Kentucky Pioneer Energy, LLC*

- Five New Clean Coal Projects: Camden Clean Energy Project Spring 1993: 2
- Clean Energy Demonstration IGCC Project Progression Spring 1999: 1
- Kentucky Pioneer IGCC/Fuel Cell Project Underway Spring 2003: 5

Piñon Pine IGCC Power Project*Sierra Pacific Power Company*

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- Advanced Power Generation Future Bright with Coal Gasification-Combined Cycle:
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- Piñon Pine IGCC Plant Construction on Schedule Summer 1996: 1
- Second Generation Coal Gasification Technology: Startup and Operations Phase in Piñon Pine IGCC Project Summer/Fall 1997: 5
- IGCC – A Glimpse Into the Future Spring 1998: 1

Tampa Electric Integrated Gasification Combined-Cycle Project*Tampa Electric Company*

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Toms Creek IGCC Demonstration Project*TAMCO Power Partners*

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Wabash River Coal Gasification Repowering Project*Wabash River Coal Gasification Repowering Project Joint Venture*

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| • O'Leary Heralds Wabash Startup | | Winter 1995: 4 |
| • Wabash Plant Begins Operating | | Spring 1996: 1 |
| • Wabash Wins Powerplant Award | | Spring 1997: 7 |
| • IGCC – A Glimpse Into the Future | | Spring 1998: 1 |
| • Wabash Completes Fourth Year of Commercial Operation | | Spring 2000: 1 |

– Coal Processing for Clean Fuels –**Advanced Coal Conversion Process Demonstration***Western SynCoal LLP*

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| • Montana Plant to Open New Markets for Plentiful Low-Rank Coals | | Fall 1991: 4 |
| • Birth of a New Industry: SynCoal® Burn Tests Spawn Commercial Studies | | Winter 1993: 1 |
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| • Rosebud Recruits Customers for Upgraded Coals | | Fall 1999: 8 |

Commercial-Scale Demonstration of the Liquid-Phase Methanol (LPMEOH™) Process*Air Products Liquid Phase Conversion Company, L.P.*

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| • Advanced Power Generation Future Bright with Coal Gasification-Combined Cycle: Six Major Projects in DOE's CCT Program | | Spring 1992: 3 |
| • Site Chosen for Coal to Methanol Energy Project | | Winter 1993: 5 |
| • LPMEOH™ Demonstration to Start Up in the Fall | | Spring 1996: 10 |
| • LPMEOH™ Demonstration Produces First Methanol From Coal | | Summer/Fall 1997: 1 |
| • LPMEOH™ Demonstration Project Completes First Year of Operation | | Summer 1998: 6 |
| • LPMEOH™ Project Performs Well During Second Year of Operation | | Summer 1999: 1 |
| • LPMEOH™ Demonstration Project Conducts Product-Use Study | | Summer 2000: 1 |
| • Clean Coal Technology Commercially Producing Methanol from Coal | | Summer 2003: 12 |

Cordero Coal Upgrading Demonstration Project*Cordero Mining Company*

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| • Nine New Clean Coal Technology Projects Selected in Fourth Round of Competition | | Fall 1991: 3 |
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Development of the Coal Quality Expert*ABB Combustion Engineering, Inc., and CQ Inc.*

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| • Clean Coal Project Will Develop Expert Computer Software Program | | Winter 1991: 6 |
| • CQ Inc. Software Tool Eases Utility Decision-Making | | Fall 1996: 1 |

ENCOAL® Mild Gasification Project*ENCOAL® Corporation*

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| • ENCOAL® Mild Gasification Project Breaks Ground in Many Ways | | Spring 1991: 6 |
| • ENCOAL® Project Continues Rapid Pace: Spring 1992 Plant Startup Expected | | Winter 1991: 1 |
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| • ENCOAL® Mild Coal Gasification Project Completes Final Reports | Spring 1998: 5 |

Self-Scrubbing Coal™: An Integrated Approach to Clean Air*Custom Coals International*

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| • Nine New Clean Coal Technology Projects Selected in Fourth Round of Competition | Fall 1991: 3 |
| • Custom Coals Nears Completion | Summer 1995: 4 |
| • Progress and Achievements | Fall 1995: 4 |
| • Materials Technology for Ultra-Supercritical Plants | Spring 2002: 3 |

– Environmental Control Devices – SO₂ Control Technologies –**10-MWe Demonstration of Gas Suspension Absorption***AirPol, Inc.*

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| • AirPol Plant Runs Smoothly: Early Tests Show High SO ₂ Removals | Winter 1992: 1 |
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Advanced Flue Gas Desulfurization Demonstration Project*Pure Air on the Lake, L.P.*

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| • Pure Air Flue Gas Project Construction Well Advanced | Spring 1991: 1 |
| • Pure Air FGD Scrubber Begins Operations: Indiana Utility Leads Nation in Clean Air Act Compliance | Summer 1992: 5 |
| • Clean Coal Project Wins Outstanding Achievement Award | Winter 1992: 3 |
| • Pure Air Project Helps Hurricane Relief Efforts | Winter 1992: 3 |
| • Continued Success with Landmark Pure Air Project | Summer 1994: 1 |
| • Progress and Achievements | Fall 1995: 4 |
| • Pure Air Project Completed | Fall 1996: 8 |

Demonstration of Innovative Applications of Technology for the CT-121 FGD Process*Southern Company Services, Inc.*

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| • Fiberglass Reinforced Plastic Highlights CT-121 “Second Generation” Wet Scrubber | Summer 1991: 2 |
| • Outperforming Conventional Systems: CT-121 Advanced Scrubber Moves Ahead at Georgia Site | Summer 1993: 1 |

Demonstration of the Union Carbide CANSOLV System at the ALCOA Generating Corporation Warrick Power Plant*Union Carbide Chemicals and Plastics Company, Inc.*

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| • Nine New Clean Coal Technology Projects Selected in Fourth Round of Competition | Fall 1991: 3 |
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LIFAC Sorbent Injection Desulfurization Demonstration Project*LIFAC-North America*

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| • LIFAC Process Tests Now Underway | Winter 1992: 4 |
| • LIFAC Nearing Marketability | Spring 1996: 7 |

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| • Wall-Fired Boiler Low NO _x Overfire Air Tests Complete | Spring 1991: 3 |
| • Georgia Power's Plant Hammond Previews Clean Air Act's NO _x Challenges | Winter 1991: 4 |
| • Progress and Achievements | Fall 1995: 4 |
| • GNOCIS Software Commercializing Globally | Summer/Fall 1997: 3 |

Demonstration of Coal Reburning for Cyclone Boiler NO_x Control*The Babcock & Wilcox Company*

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| • Cyclone Boiler Coal Reburn Technology Cuts NO _x by More Than 50 Percent | Spring 1992: 6 |
| • Coal Reburn Exceeds Expected NO _x Reductions: Control Option for High NO _x Emitting Cyclone Boilers Demonstrated | Spring 1993: 6 |

Demonstration of Selective Catalytic Reduction Technology for the Control of NO_x Emissions from High-Sulfur-Coal-Fired Boilers*Southern Company Services, Inc.*

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| • Catalyst Suppliers Selected in Southern Company's SCR Project | Summer 1991: 7 |
| • SCR Holds Promise for Effective NO _x Control: CCT Projects Address Higher Costs, Limited U.S. Experience | Summer 1992: 2 |
| • SCR Tests Progress at Gulf's Plant Crist | Summer 1993: 7 |
| • Progress and Achievements | Fall 1995: 4 |
| • SCR Successes: Catalyst Performance & NO _x Reduction | Fall 1996: 10 |

Evaluation of Gas Reburning and Low-NO_x Burners on a Wall-Fired Boiler*General Electric Energy and Environmental Research Corporation*

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| • EER's Gas Reburning: Low-NO _x Burner Technologies Reducing NO _x Emissions | Winter 1992: 6 |
| • EER Completes Three Demonstration Tests (Cherokee Station Unit 3) | Summer 1995: 6 |
| • Site Tour: Cherokee Station Unit 3 | Fall 1995: 3 |
| • Two CCT Technologies Win Industry Awards | Summer/Fall 1997: 16 |

Full-Scale Demonstration of Low-NO_x Cell Burner Retrofit*The Babcock & Wilcox Company*

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| • B&W Low-NO _x Cell Burners Fabricated | Spring 1991: 7 |
| • B&W Low-NO _x Cell Burner Tests Under Way | Summer 1992: 6 |
| • Two CCT Projects "Get the Word Out:" Low-NO _x Cell Burner Project and NOXSO SO ₂ /NO _x Removal Project | Spring 1993: 8 |
| • Clean Coal Program Marks First Commercial Success with Sale of Low-NO _x Technology | Summer 1993: 6 |

Micronized Coal Reburning Demonstration for NO_x Control on a 175-MWe Wall-Fired Unit*New York State Electric and Gas Corp.*

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| • Nine New Clean Coal Technology Projects Selected in Fourth Round of Competition | Fall 1991: 3 |
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Selective Catalytic Reduction Project (Plant Crist, Pensacola, FL)*Southern Company Services Inc.*

- SCR Holds Promise for Effective NO_x Control: CCT Projects Address Higher Costs, Limited U.S. Experience Summer 1992: 1
- Gulf Power's SCR Test Facility in Operation (Defining SCR Catalysts for U.S. High Sulfur Coals) Spring 1994: 4

– Environmental Control Devices – Combined SO₂/NO_x Control Technologies –**Commercial Demonstration of the NOXSO SO₂/NO_x Removal Flue Gas Cleanup System***NOXSO Corporation*

- Two CCT Projects "Get the Word Out:" Low-NO_x Cell Burner Project and NOXSO SO₂/NO_x Removal Project Spring 1993: 8
- Financing and Opt-In Regulations Assist NOXSO Spring 1996: 5

Enhancing the Use of Coals by Gas Reburning and Sorbent Injection*General Electric Energy and Environmental Research Corporation*

- Gas Reburning Tests Begin at Illinois Power Plant: Early Tests Exceed Expectations Summer 1991: 1
- Gas Reburning Emerging as Cost-Effective Nitrogen Oxide Reduction Technique Spring 1992: 4
- EER Completes Three Demonstration Tests (Hennepin Station Unit 1 and Lakeside Station Unit 7) Summer 1995: 6
- Two CCT Technologies Win Industry Awards Summer/Fall 1997: 16

Integrated Dry NO_x/SO₂ Emissions Control System*Public Service Company of Colorado*

- Second Colorado Project Also Opening: PSCC Tests Integrated NO_x/SO₂ Emissions Control System Winter 1992: 7
- Site Tour: Arapahoe Station Unit 4 Fall 1995: 3

LIMB Demonstration Project Extension and Coolside Demonstration*The Babcock & Wilcox Company*

- B&W's LIMB Operating; Coolside Tests Complete Winter 1990: 3

Milliken Clean Coal Technology Demonstration Project*New York State Electric & Gas Corporation*

- Nine New Clean Coal Technology Projects Selected in Fourth Round of Competition Fall 1991: 3
- Total Environmental and Energy Management: Milliken Project in Final Construction Stage Summer 1994: 6
- Progress and Achievements Fall 1995: 4
- Milliken Clean Coal Project Under Way Summer 1996: 4
- Milliken CCT Demonstration Project Nears Completion Summer 1999: 5

SNOX™ Flue Gas Cleaning Demonstration Project (Formerly Ohio Edison, Niles Station)*ABB Environmental Systems*

- WSA-SNOX™ Offers Multiple Pollutant Capture, Efficiency, Salable By-Products Fall 1991: 6
- SNOX™ Demonstration on Line Winter 1991: 3
- SCR Holds Promise for Effective NO_x Control: CCT Projects Address Higher Costs, Limited U.S. Experience (SNOX™) Summer 1992: 1

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SO_x-NO_x-Rox Box™ Flue Gas Cleanup Demonstration Project*The Babcock & Wilcox Company*

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| • Success is in the Ceramic Bag: B&W's SO _x -NO _x -Rox Box™ Starts Up | Spring 1992: 6 |
| • SCR Holds Promise for Effective NO _x Control: CCT Projects Address Higher Costs, Limited U.S. Experience (SNRB) | Summer 1992: 2 |
| • Progressive Technology Exceeds Expectations | Summer 1993: 3 |

– Industrial Applications –**Advanced Cyclone Combustor with Internal Sulfur, Nitrogen, and Ash Control***Coal Tech Corporation*

- | | |
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| • Coal Tech Completes Combustor Operations | Winter 1990: 4 |
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Blast Furnace Granulated-Coal Injection System Demonstration Project*Bethlehem Steel Corporation*

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| • Bethlehem on Schedule for Early 1995 Startup: Blast Furnace Coal Facility in Construction | Spring 1994: 2 |
| • Progress and Achievements | Fall 1995: 4 |
| • Cleaner Iron-Making Process in Full-Scale Testing | Summer 1996: 6 |
| • Bethlehem Steel Successfully Completes Demonstration | Winter 1999: 1 |

Cement Kiln Flue Gas Recovery Scrubber*Passamaquoddy Tribe*

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| • Passamaquoddy Cement Kiln Project Begins Operations | Spring 1991: 4 |
| • Success Continued at Cement Kiln Project | Fall 1992: 6 |

Clean Power from Integrated Coal/Ore Reduction (COREX®)*Centerior Energy Corporation*

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| • Five New Clean Coal Projects: Clean Power from Integrated COREX®-CPICOR™ Process | Spring 1993: 3 |
| • CPICOR™ Project Awarded | Winter 1996: 6 |

Demonstration of Pulse Combustion in an Application for Steam Gasification of Coal*ThermoChem, Inc.*

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| • Nine New Clean Coal Technology Projects Selected in Fourth Round of Competition | Fall 1991: 3 |
| • ThermoChem, Inc. CCT-IV Project Revised | Winter 1998: 10 |

Innovative Coke Oven Gas Cleaning System for Retrofit Applications*Bethlehem Steel Corporation*

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| • Bethlehem Steel's Innovative Cleanup System Nears Completion at Sparrows Point | Summer 1991: 4 |
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